CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

February 20, 1998 / Vol. 47 / No. 6

MMWR™
MORBIDITY AND MORTALITY WEEKLY REPORT

Hyperthermia and Dehydration-Related Deaths Associated with Intentional Rapid Weight Loss in Three Collegiate Wrestlers — North Carolina, Wisconsin, and Michigan, November–December 1997

During November 7–December 9, 1997, three previously healthy collegiate wrestlers in different states died while each was engaged in a program of rapid weight loss to qualify for competition. In the hours preceding the official weigh-in, all three wrestlers engaged in a similar rapid weight-loss regimen that promoted dehydration through perspiration and resulted in hyperthermia. The wrestlers restricted food and fluid intake and attempted to maximize sweat losses by wearing vapor-impermeable suits under cotton warm-up suits and exercising vigorously in hot environments. This report summarizes the investigation of these three cases.

Case Reports

Case 1. During November 6–7, over a 12-hour period, a 19-year-old man in North Carolina attempted to lose 15 lbs to compete in the 195-lb weight class of a wrestling tournament scheduled for November 8. His preseason weight on August 27 was 233 lbs, and during the next 10 weeks he lost 23 lbs. On November 6, from 3 p.m. to 11:30 p.m., using the weight-loss regimen described above, he lost an additional 9 lbs. After a 2-hour rest, he resumed his weight-loss regimen on November 7 at 1:45 a.m. At approximately 2:45 a.m., he stopped exercising but began to experience extreme fatigue and became incommunicative; an hour later, he developed cardiorespiratory arrest. Resuscitation was unsuccessful. Chemistry findings in vitreous humor obtained 7 hours after death were sodium, 152 mmol/L (normal postmortem: 135–151 mmol/L); urea nitrogen, 40 mg/dL (normal postmortem: ≤40 mg/dL); and urine myoglobin, <20 ng/mL (normal antemortem: 0–40 ng/mL); creatinine results were unavailable. Anatomic findings from the autopsy were insufficient to determine the cause of death.

Case 2. On November 21, over a 4-hour period, a 22-year-old man in Wisconsin attempted to lose 4 lbs to compete in the 153-lb weight class of a wrestling tournament scheduled for November 22. His preseason weight on September 6 was 178 lbs. During the next 10 weeks he lost 21 lbs, of which 8 lbs were lost during November 17–20. On November 21 at 5:30 a.m., he initiated the same weight-loss regimen as in case 1. An hour later, he complained of shortness of breath but continued exercising.

Hyperthermia and Dehydration-Related Deaths — Continued

By 8:50 a.m., he had lost 3.5 lbs. He drank approximately 8 oz of water, rested for 30 minutes, and resumed exercise. At 9:30 a.m., he stopped exercising and indicated he was not feeling well. Efforts were made to cool him, and his clothing was removed. He became unresponsive and developed cardiorespiratory arrest; resuscitation was unsuccessful. Chemistry findings in antemortem blood were serum sodium, 161 mmol/L (normal: 136–145 mmol/L); urea nitrogen, 34 mg/dL (normal: 7–18 mg/dL); and creatinine, 5.0 mg/dL (normal: 0.8–1.3 mg/dL). Serum myoglobin was >5000 ng/mL (normal: 0–110 ng/mL). Rectal temperature was 108 F (42 C) at the time of death. The autopsy report cited the cause of death as hyperthermia.

Case 3. On December 9, over a 3-hour period, a 21-year-old man in Michigan attempted to lose 6 lbs to compete in the 153-lb weight class of a wrestling meet scheduled for December 10. His preseason weight on September 4 was 180 lbs. During the next 13 weeks he lost 21 lbs, of which 11 lbs were lost during December 6–8. On December 9, from 3:30 p.m. to 5 p.m., he lost 2.3 lbs and weighed 156.7 lbs. After wrestling practice, he initiated the same weight-loss regimen as in case 1; after 75 minutes, he had lost an additional 2 lbs. After a 15-minute rest, he resumed exercise. Approximately 1 hour later, he stopped exercising to weigh himself and demonstrated fatigue. A few minutes later, his legs became unsteady, he became incommunicative, and he had difficulty breathing. Attempts to administer fluid orally were unsuccessful, and he developed cardiorespiratory arrest. Resuscitation was unsuccessful. Chemistry findings in vitreous humor obtained 4 hours after death were sodium, 159 mmol/L (normal: 136–146 mmol/L); urea nitrogen, 31 mg/dL (normal: 8–20 mg/dL); and creatinine, 0.7 mg/dL (normal: 0.9–1.3 mg/dL). Urine myoglobin was 4280 ng/mL (normal: 0–45 ng/mL). The autopsy report cited the cause of death as rhabdomyolysis.

Reported by: D Remick, MD, Univ of Michigan, Ann Arbor, Michigan. K Chancellor, MD, North Carolina Dept of Health and Human Svcs. J Pederson, MD, Franciscan Skemp Healthcare, LaCrosse, Wisconsin. EJ Zambraski, PhD, Rutgers Univ, Piscataway, New Jersey. MN Sawka, PhD, CB Wenger, MD, US Army Research Institute of Environmental Medicine, Natick, Massachusetts. Office of Regulatory Affairs; Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration. Div of Environmental Hazards and Health Effects, National Center for Environmental Health; Div of Nutrition and Physical Activity, National Center for Chronic Disease Prevention and Health Promotion, CDC.

Editorial Note: This report describes the first identified deaths in collegiate wrestling and the first deaths associated with intentional rapid weight loss in interscholastic or collegiate wrestling since national record keeping began in 1982 (*1*). Many coaches and wrestlers believe that wrestlers should compete at a weight category lower than their preseason weight to maximize their competitive advantage (*2,3*). To reach their competition weight, many wrestlers achieve rapid weight loss by dehydration through such practices as vigorous exercise, fluid restriction, wearing vapor-impermeable suits, and using hot environments (e.g., saunas, hot rooms, and steam rooms). More extreme but less common measures include consuming diuretics, emetics, and laxatives and self-induced vomiting (*2,3*). A combination of these practices are often used during the days that precede each competition (*4*). Alone or in combination, these practices can adversely affect cardiovascular function, electrical activity, thermal regulation, renal function, electrolyte balance, body composition, and muscular endurance and strength (*3,5,6*).

Hyperthermia and Dehydration-Related Deaths — Continued

Vigorous exercise and dehydration increase body temperature, which is further increased by use of vapor-impermeable suits that decrease evaporative and convective heat loss. In the three cases presented in this report, all three wrestlers used vapor-impermeable suits and exercised vigorously in hot environments. These conditions promoted dehydration and heat-related illness (*3,5,6*). In all three cases, elevated sodium and urea in antemortem blood or postmortem vitreous fluid indicated clear evidence of dehydration. The exercise regimen, the elevated rectal temperature in case 2, and the rhabdomyolysis and myoglobinuria in case 3 indicate that hyperthermia may have contributed to these deaths (*6,7*).

Among the three wrestlers, the difference between their preseason weight and their goal weight for competition was 30 lbs (range: 25–37 lbs), or approximately 15% of total body weight. Among collegiate wrestlers, the difference between their preseason and competitive weights averages approximately 16 lbs (*5*), or approximately 10% of total body weight (*4*). These cases highlight the extreme extent of absolute and relative weight loss. Under such conditions, particularly when dehydration is involved, there are no established limits for safe weight loss.

To ensure fair and safe competition, wrestlers compete within defined weight categories. At the time of these deaths, existing National Collegiate Athletic Association (NCAA) guidelines recommended that the rapid weight-loss behaviors associated with these deaths be prohibited (*8*). Using practices contrary to the guidelines, all three wrestlers, while under the supervision of athletic staff, attempted to lose unsafe amounts of weight in a short period of time. The findings in the three cases suggest that failure to follow these guidelines may have contributed to these deaths. The weight-loss behaviors reported in these three cases are common among wrestlers; however, deaths associated with weight loss in collegiate wrestling have not been reported previously (*1*). No information is available to indicate whether the amount or rate of intentional weight loss or other conditioning practices may have changed recently among collegiate wrestlers.

As a result of these deaths, the NCAA revised the guidelines governing weight-loss practices and weigh-in procedures and added penalties for noncompliance (*9*). The NCAA now prohibits the use of laxatives, emetics, diuretics, excessive food and fluid restriction, self-induced vomiting, hot rooms >79 F (>26 C), hot boxes, saunas, steam rooms, vapor-impermeable suits, and artificial rehydration techniques (e.g., intravenous hydration between weigh-in and competition). In addition, for this season the NCAA has added a 7-lb weight allowance to each weight class, required all wrestlers to compete only in the weight class that they were in as of January 7, and stipulated that all weigh-ins be held no more than 2 hours before the beginning of competition. The NCAA plans to reassess its wrestling policies this spring. The effectiveness of these changes should be monitored and evaluated.

The sudden deterioration and resulting deaths of previously healthy, young, well-trained athletes underscores the need to eliminate weight-control practices that emphasize extreme or rapid weight loss. To ensure safe weight-control practices, a health-care professional should identify an appropriate competition weight and specify rates and limits of allowable weight loss for each wrestler. In addition, coaches and athletes should be trained in proper weight-control strategies and work collaboratively with a health-care professional to develop and monitor a weight-control regimen. Use of intentional dehydration to lose weight should be prohibited. To monitor

Hyperthermia and Dehydration-Related Deaths — Continued

compliance, a practical test to assess hydration status should be explored and employed. In addition, existing surveillance systems should be strengthened to evaluate effectiveness in preventing athletic injuries, illnesses (e.g., hyperthermia and dehydration), and deaths among the 400,000 wrestlers who participate annually in the United States (*10*). Because wrestlers have traditionally used dehydration as a means to lose weight, vigorous efforts will be necessary to ensure compliance with rules and guidelines designed to reduce health risks and the potential for death.

References

1. Mueller FO, Cantu RC. National Center for Catastrophic Sports Injury Research: fourteenth annual report—Fall 1982–Spring 1996. Chapel Hill, North Carolina: National Center for Catastrophic Sports Injury Research, 1996.
2. Oppliger RA, Case HS, Horswill CA, Landry GL, Shelter AC. American College of Sports Medicine position statement: weight-loss in wrestlers [Review]. Med Sci Sports Exerc 1996;28:ix–xii.
3. Horswill CA. Applied physiology of amateur wrestling. Sports Med 1992;14:114–43.
4. Scott JR, Horswill CA, Dick RW. Acute weight gain in collegiate wrestlers following a tournament weigh-in. Med Sci Sports Exerc 1994;26:1181–5.
5. Steen SN, Brownell KD. Patterns of weight loss and regain in wrestlers: has the tradition changed? Med Sci Sports Exerc 1990;22:762–8.
6. Sawka MN, Young AJ, Francesconi RP, Muza SR, Pandolf KB. Thermoregulatory and blood responses during exercise at graded hypohydration levels. J Appl Physiol 1985;59:1394–401.
7. Knochel JP. Catastrophic medical events with exhaustive exercise: "white collar rhabdomyolysis." Kidney Int 1990;38:709–19.
8. National Collegiate Athletic Association. NCAA sports medicine handbook. 9th ed. Overland Park, Kansas: National Collegiate Athletic Association, 1997.
9. National Collegiate Athletic Association. Immediate wrestling rules changes on weight [Memorandum]. Overland Park, Kansas: National Collegiate Athletic Association, January 13, 1998.
10. USA Wrestling. Wrestling demographic profile [Memorandum]. Colorado Springs, Colorado: USA Wrestling, February 3, 1998.

National, State, and Urban Area Vaccination Coverage Levels Among Children Aged 19–35 Months — United States, July 1996–June 1997

The National Immunization Survey (NIS) is an ongoing survey that provides national estimates of vaccination coverage among children aged 19–35 months* based on data for the most recent 12 months for each of the 50 states, the District of Columbia, and 27 other selected urban areas (*1,2*). CDC initiated the NIS in April 1994 to monitor vaccination coverage levels as part of the Childhood Immunization Initiative (CII), a national strategy to ensure high vaccination coverage of children during the first 2 years of life (*3*). This report presents NIS findings for July 1996–June 1997, which indicate that vaccination levels among U.S. children aged 19–35 months remain the highest ever recorded. This report also includes the first annualized estimates for varicella vaccine coverage.

NIS uses a quarterly random-digit–dialed sample of telephone numbers for each survey area to collect vaccination information for all eligible children. During July 1996–June 1997, a total of 32,652 household interviews were completed, representing 33,064 children (mean: 424 children per survey area). The overall response

*For this reporting period (July 1996–June 1997), the NIS included children born during August 1993–November 1995 (median age: 27 months).

Vaccination Coverage Levels — Continued

rate for eligible households was 67% for all 78 survey areas (range: 55%–83%). For completeness and verification, vaccination data also are requested from vaccination providers. Provider data are weighted to represent the entire group of children surveyed and to account for household nonresponse, natality data, and the lower vaccination coverage levels among children in households without telephones (*1,2,4*).

Compared with 1996, national vaccination coverage with all individual vaccines and the 4:3:1[†] and 4:3:1:3[§] series during July 1996–June 1997 remained stable at high levels, except that coverage with hepatitis B vaccine showed a small, but statistically significant, increase of 1.5% (from 81.8% to 83.3%) (Table 1).

The national coverage level for varicella vaccine during July 1996–June 1997 was 19% (Table 1). During the last quarter of this reporting period (April–June 1997), national varicella vaccine coverage was 25% (Table 1). For July 1996–June 1997, varicella coverage levels ranged from 3% to 33% (median: 17%) among states and from 7% to 33% (median: 16%) among selected urban areas (Table 2).

During July 1996–June 1997, estimated state-specific coverage levels for the 4:3:1 series ranged from 69% to 91% (median: 79%), and for the 4:3:1:3 series, from 67% to 88% (median: 77%) (Table 3). Estimated coverage levels among selected urban areas ranged from 63% to 86% (median: 77%) for the 4:3:1 series and from 61% to 85% (median: 74%) for the 4:3:1:3 series (Table 4). Compared with 1996, there were statistically significant changes in state-specific coverage with the 4:3:1:3 series in West Virginia (from 71% to 80%) and New York (from 79% to 74%); among selected urban areas, changes were statistically significant in Marion County, Indiana (from 72% to 78%), and the District of Columbia (from 78% to 72%). During July 1996–June 1997, the coverage range for 4:3:1:3 among the states narrowed compared with 1996 (range: 67%–88% versus 63%–87%, respectively). For urban areas, the 4:3:1:3 coverage range remained virtually unchanged (61%–85% in July 1996–June 1997 versus 62%–84% in 1996) (*2*).

Compared with 1996, the number of states and selected urban areas that met the 1996 CII coverage goal for three or more doses of hepatitis B vaccine increased from 48 to 50 and from 27 to 28, respectively. The number that met the goal for three or more doses of DTP increased from 48 to 50 states and decreased from 26 to 25 urban areas; urban areas that did not meet the goal were within 2% below the goal. The number that met the goal for three or more doses of poliovirus vaccine increased from 38 to 40 states and decreased from 17 to 13 urban areas; all remaining states and 13 of the remaining 15 urban areas had coverage levels of 85%–89%. For one or more doses of MCV, the number reaching the 1996 interim coverage goal for measles-mumps-rubella vaccine (MMR) increased from 32 to 37 states, but decreased from 19 to 18 urban areas; all the remaining states and eight of the 10 remaining urban areas had coverage levels of 85%–89%. The number that met the goal for three or more doses of Hib vaccine increased from 41 to 45 states but decreased from 19 to 18 urban areas; all remaining states and nine of the remaining 10 urban areas had coverage levels of 85%–89%. Overall, the number that met all CII vaccination coverage goals, including

[†]Four or more doses of diphtheria and tetanus toxoids and pertussis vaccine/diphtheria and tetanus toxoids (DTP/DT), three or more doses of poliovirus vaccine, and one or more doses of measles-containing vaccine (MCV).

[§]Four or more doses of DTP/DT, three or more doses of poliovirus vaccine, one or more doses of MCV, and three or more doses of *Haemophilus influenzae* type b vaccine (Hib).

Vaccination Coverage Levels — Continued

the goal for hepatitis B vaccine, increased from 30 to 33 states, but decreased from 14 to 11 urban areas (*2*).

Reported by: National Center for Health Statistics; Assessment Br, Data Management Div, National Immunization Program, CDC.

Editorial Note: The NIS data in this report indicate that all national coverage goals established by CII for 1996 have been met or exceeded for the vaccines routinely recommended for children. Attainment of these goals reflects the widespread implementation of the comprehensive CII strategy by public- and private-sector organizations and health-care providers at the national, state, and local levels (*3*).

TABLE 1. Childhood Immunization Initiative (CII) goals for 1996 and vaccination coverage levels among children aged 19–35 months, by selected vaccines — United States,* National Immunization Survey, July 1996–June 1997†

Vaccine/Dose	CII 1996 goals	12-Month estimate: January–December 1996§ %	12-Month estimate: January–December 1996§ (95% CI¶)	12-Month estimate: July 1996–June 1997 %	12-Month estimate: July 1996–June 1997 (95% CI)	3-Month estimate: April–June 1997 %	3-Month estimate: April–June 1997 (95% CI)
DTP/DT**							
≥3 Doses	90%	95%	(±0.4%)	95%	(±0.4%)	95%	(±0.6%)
≥4 Doses	—	81%	(±0.7%)	81%	(±0.7%)	82%	(±1.0%)
Poliovirus							
≥3 Doses	90%	91%	(±0.5%)	91%	(±0.5%)	90%	(±0.8%)
Hib††							
≥3 Doses	90%	92%	(±0.5%)	92%	(±0.5%)	93%	(±0.7%)
MCV§§							
≥1 Dose	90%	91%	(±0.5%)	90%	(±0.5%)	91%	(±0.8%)
Hepatitis B							
≥3 Doses	70%	82%	(±0.7%)	83%	(±0.6%)	84%	(±1.0%)
Varicella¶¶							
1 Dose	—	NA***	—	19%	(±0.6%)	25%	(±1.1%)
Combined series							
4 DTP/3 Polio/1 MCV†††	—	78%	(±0.8%)	78%	(±0.7%)	78%	(±1.1%)
4 DTP/3 Polio/1 MCV/ 3 Hib§§§	—	77%	(±0.8%)	76%	(±0.8%)	77%	(±1.1%)

* One of the national health objectives for the year 2000 is to achieve series-complete coverage for the recommended vaccines among ≥90% of children aged 2 years.
† Children in this survey period were born during August 1993–November 1995.
§ Children in this survey period were born during February 1993–May 1995.
¶ Confidence interval.
** Diphtheria and tetanus toxoids and pertussis vaccine/diphtheria and tetanus toxoids.
†† *Haemophilus influenzae* type b vaccine.
§§ Any measles-containing vaccine; vaccination coverage goals are for measles-mumps-rubella (MMR) vaccine.
¶¶ One dose administered on or after the first birthday.
*** Not available for this reporting period. Data collection began in July 1996.
††† Four or more doses of DTP/DT, three or more doses of poliovirus vaccine, and one or more doses of MCV.
§§§ Four or more doses of DTP/DT, three or more doses of poliovirus vaccine, one or more doses of MCV, and three or more doses of Hib.

Vaccination Coverage Levels — Continued

Coverage with hepatitis B vaccine for July 1996–June 1997 increased slightly over 1996 levels, whereas sizable increases occurred from 1994 to 1995 (from 37% to 68%) and from 1995 to 1996 (from 68% to 82%). These findings indicate that substantial effort will be required to attain the 1998 interim national goal of 90% for hepatitis B vaccine (*2,3,5*).

Before the availability of varicella vaccine, approximately 4 million cases occurred each year in the United States, resulting in an annual average of 105 deaths and 4000–9000 hospitalizations. Most cases occur among children and are preventable by vaccination. In 1997, several deaths attributed to varicella among adults were associated with transmission from unvaccinated preschool-aged family members; these deaths underscore the importance of universal childhood vaccination for varicella (*6*).

This reporting period coincided with the first 12 months since the inclusion of varicella vaccine in the recommended childhood immunization schedule in July 1996. The national coverage estimate for varicella vaccine was the lowest of all the recommended vaccines, partially because most children surveyed during this reporting period were aged >18 months before the vaccine was first recommended (*2*). The wide variation of varicella vaccine coverage by state (from 3% to 33%; median: 16%) indicates a need for special efforts in states with lower coverage levels. The national estimates for the last quarter of this reporting period suggest an upward trend in varicella vaccination coverage. Additional increases are expected with the implementation of the extended financing of varicella vaccination by the Vaccines for Children Program (VFC), which makes available all recommended vaccines to public- and private-sector health-care providers for children who qualify (*7*). State and local public health officials should encourage more public- and private-sector providers to participate in VFC, which should be especially beneficial for uninsured children and children living below the poverty level.

In this reporting period, the 4:3:1 and 4:3:1:3 series coverage remained relatively unchanged. These findings primarily reflect relatively low coverage with the fourth dose of DTP (81%) (Table 1). On the basis of these data, approximately 1 million children still need one or more of the recommended doses of vaccine to be fully protected.

Although national 1996 CII coverage goals have been attained for all individual vaccines, coverage differed substantially by state and urban area, and many states and urban areas did not meet the 1996 CII goals for the individual vaccines. Moreover, 13 states and 10 urban areas have not achieved the 1995 interim goal for MCV (90%); two urban areas have not achieved the 1995 goal for poliovirus vaccine (85%); and one urban area has not achieved the 1995 goal for Hib vaccine (85%) (*2*). Vaccination providers in these areas should intensify their efforts, so that children are equally well protected throughout the United States.

The addition of new vaccines (e.g., varicella vaccine) to the existing vaccination schedule presents a challenge to the vaccine-delivery system that must be met before the full benefits of new vaccine technology can be realized. The achievement of the 1996 goals during July 1996–June 1997 was a major milestone in the effort to control vaccine-preventable diseases; however, this reporting period indicated only one net gain compared with 1996: a modest increase in hepatitis B vaccine coverage. Furthermore, except for varicella vaccine, no other meaningful increases were detected for the last quarter of this reporting period, which may suggest a leveling off in

Vaccination Coverage Levels — Continued

TABLE 2. Estimated vaccination coverage with individual vaccines routinely recommended for children aged 19–35 months, by state and selected urban area — United States, National Immunization Survey, July 1996–June 1997*

State/ Urban area	≥3 DTP†		≥4 DTP§		≥3 Polio¶		≥1 MCV**		≥3 Hib††		≥3 Hepatitis B§§		≥1 Varicella¶¶	
	%	(95% CI***)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
Alabama†††	95	(±2.2)	83	(±3.6)	90	(±2.7)	90	(±2.8)	92	(±2.6)	85	(±3.2)	15	(±2.8)
Jefferson Co.§§§	97	(±1.8)	84	(±4.2)	89	(±3.6)	93	(±2.9)	94	(±2.7)	89	(±3.6)	24	(±4.7)
Alaska§§§	94	(±2.9)	78	(±4.8)	90	(±3.4)	87	(±4.0)	87	(±4.0)	86	(±3.5)	9	(±3.1)
Arizona§§§	91	(±2.5)	74	(±3.6)	87	(±2.8)	86	(±2.9)	89	(±2.6)	81	(±2.9)	17	(±2.8)
Maricopa Co.§§§	90	(±3.5)	72	(±5.0)	86	(±3.9)	87	(±3.8)	88	(±3.8)	80	(±4.1)	19	(±4.1)
Arkansas§§§	94	(±2.7)	81	(±4.3)	91	(±3.1)	90	(±3.2)	89	(±3.5)	88	(±3.2)	11	(±3.2)
California§§§	93	(±1.9)	79	(±3.0)	89	(±2.3)	89	(±2.3)	89	(±2.3)	81	(±2.7)	26	(±2.6)
Los Angeles Co.§§§	93	(±3.1)	80	(±4.9)	88	(±3.9)	90	(±3.3)	92	(±3.2)	80	(±4.9)	27	(±5.0)
Santa Clara Co.†††	96	(±2.2)	85	(±3.9)	92	(±3.0)	93	(±2.8)	91	(±3.3)	87	(±3.4)	33	(±5.0)
San Diego Co.†††	94	(±2.9)	81	(±4.4)	90	(±3.4)	93	(±2.8)	90	(±3.4)	83	(±4.1)	24	(±4.2)
Colorado§§§	93	(±3.1)	78	(±4.9)	87	(±4.1)	92	(±3.1)	90	(±3.6)	74	(±5.1)	16	(±3.9)
Connecticut†††	99	(±0.8)	93	(±2.7)	96	(±1.9)	95	(±2.3)	97	(±1.8)	87	(±3.5)	23	(±4.4)
Delaware†††	98	(±1.8)	84	(±4.3)	94	(±2.7)	91	(±3.4)	96	(±2.2)	88	(±3.5)	18	(±4.0)
District of Columbia§§§	95	(±2.6)	80	(±4.8)	89	(±3.8)	91	(±3.4)	90	(±3.7)	80	(±4.7)	22	(±4.5)
Florida†††	95	(±2.0)	81	(±3.5)	90	(±2.7)	90	(±2.8)	91	(±2.7)	82	(±3.2)	22	(±3.2)
Duval Co.†††	95	(±2.6)	76	(±4.9)	90	(±3.4)	90	(±3.4)	93	(±3.0)	87	(±3.6)	25	(±4.6)
Dade Co.†††	95	(±2.5)	82	(±4.5)	91	(±3.4)	91	(±3.4)	92	(±3.2)	78	(±4.7)	16	(±4.1)
Georgia†††	98	(±1.2)	85	(±3.1)	95	(±1.9)	92	(±2.4)	95	(±1.8)	89	(±2.5)	16	(±3.0)
Fulton/DeKalb Cos.†††	96	(±2.2)	81	(±4.7)	91	(±3.4)	93	(±3.1)	92	(±3.2)	81	(±4.5)	24	(±4.7)
Hawaii†††	96	(±2.2)	84	(±4.1)	92	(±3.0)	95	(±2.4)	94	(±2.5)	87	(±3.6)	22	(±4.5)
Idaho§§§	91	(±3.3)	72	(±4.9)	88	(±3.6)	86	(±3.8)	87	(±3.7)	77	(±4.2)	3	(±1.4)
Illinois§§§	95	(±1.9)	82	(±3.4)	89	(±2.8)	90	(±2.7)	91	(±2.5)	81	(±3.3)	13	(±2.8)
City of Chicago§§§	95	(±2.9)	78	(±5.0)	88	(±4.1)	89	(±3.6)	88	(±4.1)	77	(±5.0)	7	(±2.9)
Indiana§§§	94	(±1.9)	77	(±3.5)	89	(±2.7)	87	(±2.9)	92	(±2.2)	80	(±3.1)	13	(±2.6)
Marion Co.§§§	93	(±3.0)	80	(±4.7)	90	(±3.6)	89	(±3.6)	91	(±3.4)	79	(±4.6)	17	(±4.1)
Iowa†††	98	(±1.4)	85	(±3.5)	94	(±2.2)	90	(±3.0)	96	(±1.8)	85	(±3.4)	13	(±3.2)
Kansas†††	94	(±2.9)	81	(±4.4)	90	(±3.5)	90	(±3.4)	91	(±3.2)	78	(±4.5)	18	(±3.8)
Kentucky†††	95	(±2.4)	81	(±4.3)	92	(±3.0)	90	(±3.4)	93	(±2.8)	85	(±3.9)	17	(±4.0)
Louisiana†††	97	(±1.3)	86	(±3.3)	93	(±2.3)	93	(±2.3)	96	(±1.6)	85	(±3.3)	10	(±2.7)
Orleans Parish§§§	94	(±3.1)	76	(±5.8)	85	(±4.9)	87	(±4.6)	92	(±3.7)	78	(±5.5)	10	(±3.8)
Maine†††	98	(±1.1)	93	(±2.4)	94	(±2.4)	95	(±2.0)	95	(±2.1)	82	(±3.6)	8	(±2.6)
Maryland†††	97	(±1.5)	86	(±3.2)	93	(±2.3)	93	(±2.3)	94	(±2.2)	83	(±3.2)	27	(±3.8)
City of Baltimore†††	98	(±1.7)	90	(±3.5)	92	(±3.1)	94	(±2.7)	96	(±2.4)	81	(±4.6)	15	(±4.0)
Massachusetts†††	98	(±1.0)	91	(±2.4)	95	(±1.9)	96	(±1.6)	96	(±1.8)	89	(±2.6)	13	(±2.5)
City of Boston†††	98	(±1.6)	89	(±3.4)	94	(±2.8)	94	(±2.6)	96	(±2.3)	89	(±3.4)	9	(±3.2)
Michigan†††	94	(±2.0)	78	(±3.6)	91	(±2.4)	91	(±2.4)	90	(±2.5)	81	(±3.2)	14	(±2.8)
City of Detroit§§§	88	(±3.8)	70	(±5.3)	81	(±4.6)	84	(±4.3)	79	(±4.8)	70	(±5.2)	12	(±3.6)
Minnesota†††	97	(±1.6)	89	(±3.1)	93	(±2.5)	94	(±2.5)	96	(±2.1)	78	(±4.2)	33	(±4.5)
Mississippi†††	96	(±1.8)	83	(±4.0)	93	(±2.6)	91	(±3.0)	94	(±2.4)	84	(±3.8)	6	(±2.4)
Missouri§§§	94	(±2.8)	78	(±4.5)	90	(±3.4)	89	(±3.5)	93	(±2.8)	82	(±4.2)	21	(±4.1)
Montana§§§	96	(±2.2)	83	(±3.9)	91	(±2.9)	89	(±3.3)	93	(±2.6)	81	(±4.0)	14	(±3.3)
Nebraska†††	96	(±2.0)	83	(±3.8)	93	(±2.7)	90	(±3.2)	93	(±2.7)	81	(±3.8)	17	(±3.8)
Nevada§§§	93	(±2.9)	75	(±4.9)	90	(±3.4)	87	(±3.9)	91	(±3.3)	84	(±3.8)	6	(±2.3)
New Hampshire†††	98	(±1.2)	87	(±3.6)	93	(±2.7)	94	(±2.5)	96	(±2.0)	86	(±3.4)	15	(±3.5)
New Jersey†††	98	(±1.6)	78	(±4.6)	92	(±3.0)	91	(±3.3)	95	(±2.4)	89	(±2.9)	20	(±3.8)
City of Newark§§§	94	(±3.1)	68	(±5.9)	82	(±5.0)	87	(±4.3)	89	(±4.0)	78	(±5.3)	8	(±3.0)
New Mexico§§§	94	(±2.7)	81	(±4.4)	90	(±3.4)	89	(±3.6)	91	(±3.4)	81	(±4.1)	15	(±3.6)

Vaccination Coverage Levels — Continued

TABLE 2. Estimated vaccination coverage with individual vaccines routinely recommended for children aged 19–35 months, by state and selected urban area — United States, National Immunization Survey, July 1996–June 1997* — Continued

State/ Urban area	≥3 DTP†		≥4 DTP§		≥3 Polio¶		≥1 MCV**		≥3 Hib††		≥3 Hepatitis B§§		≥1 Varicella¶¶	
	%	(95% CI***)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)
New York†††	96	(±1.6)	82	(±3.2)	90	(±2.6)	91	(±2.3)	91	(±2.4)	83	(±2.9)	20	(±2.9)
New York City§§§	95	(±2.9)	81	(±4.6)	89	(±3.9)	92	(±3.3)	89	(±3.9)	81	(±4.4)	15	(±4.0)
North Carolina†††	98	(±1.6)	85	(±3.8)	96	(±1.9)	91	(±3.0)	94	(±2.6)	90	(±3.0)	18	(±4.0)
North Dakota†††	95	(±2.3)	85	(±3.7)	91	(±3.1)	90	(±3.1)	93	(±2.6)	84	(±3.6)	13	(±3.2)
Ohio†††	96	(±1.6)	81	(±3.2)	91	(±2.4)	92	(±2.2)	94	(±2.0)	84	(±2.8)	17	(±2.8)
Cuyahoga Co.†††	97	(±2.1)	80	(±4.6)	92	(±3.2)	92	(±3.0)	94	(±2.6)	84	(±4.0)	16	(±3.8)
Franklin Co.§§§	97	(±2.2)	79	(±4.9)	88	(±4.0)	92	(±3.3)	93	(±3.1)	79	(±4.7)	22	(±4.5)
Oklahoma§§§	95	(±2.6)	76	(±4.9)	89	(±3.6)	88	(±3.8)	93	(±2.9)	81	(±4.2)	18	(±4.0)
Oregon§§§	92	(±3.0)	77	(±4.4)	86	(±3.7)	88	(±3.4)	90	(±3.2)	78	(±4.2)	20	(±3.8)
Pennsylvania†††	97	(±1.6)	85	(±3.4)	93	(±2.3)	92	(±2.5)	93	(±2.4)	85	(±3.1)	33	(±3.8)
Philadelphia Co.†††	96	(±2.3)	84	(±4.5)	94	(±3.0)	90	(±3.7)	92	(±3.3)	86	(±4.2)	32	(±5.5)
Rhode Island†††	99	(±0.8)	88	(±3.5)	94	(±2.5)	95	(±2.2)	95	(±2.4)	88	(±3.3)	26	(±4.5)
South Carolina†††	97	(±1.8)	86	(±3.6)	94	(±2.5)	93	(±2.7)	96	(±2.0)	89	(±2.9)	18	(±3.8)
South Dakota†††	96	(±1.8)	83	(±3.8)	91	(±2.9)	92	(±2.5)	95	(±2.2)	79	(±4.1)	5	(±2.1)
Tennessee†††	96	(±1.4)	82	(±2.8)	93	(±1.7)	91	(±2.1)	94	(±1.7)	84	(±2.5)	15	(±2.4)
Shelby Co.§§§	93	(±2.9)	75	(±4.9)	87	(±3.9)	86	(±4.0)	89	(±3.6)	86	(±3.4)	18	(±4.1)
Davidson Co.§§§	94	(±2.5)	83	(±4.0)	89	(±3.3)	91	(±3.0)	92	(±2.8)	81	(±4.1)	25	(±4.4)
Texas§§§	94	(±1.7)	77	(±3.1)	89	(±2.3)	90	(±2.2)	91	(±2.0)	84	(±2.3)	15	(±2.3)
Dallas Co.§§§	93	(±3.3)	77	(±5.4)	88	(±4.3)	89	(±4.1)	88	(±4.2)	85	(±4.0)	20	(±4.7)
El Paso Co.§§§	88	(±3.8)	70	(±5.3)	86	(±4.0)	84	(±4.2)	85	(±4.2)	79	(±4.2)	11	(±3.1)
City of Houston§§§	89	(±4.0)	68	(±5.9)	86	(±4.5)	85	(±4.6)	86	(±4.5)	79	(±4.8)	14	(±4.1)
Bexar Co.†††	96	(±2.2)	81	(±4.4)	93	(±2.8)	91	(±3.2)	93	(±2.7)	88	(±3.1)	15	(±3.9)
Utah§§§	92	(±3.0)	72	(±4.8)	89	(±3.4)	86	(±3.8)	90	(±3.3)	75	(±4.4)	10	(±2.9)
Vermont†††	98	(±1.0)	89	(±3.0)	95	(±1.9)	93	(±2.5)	96	(±1.8)	82	(±3.5)	15	(±3.4)
Virginia†††	96	(±2.0)	80	(±4.5)	91	(±3.1)	90	(±3.4)	95	(±2.4)	86	(±3.6)	24	(±4.4)
Washington†††	97	(±1.4)	84	(±2.9)	94	(±1.8)	91	(±2.2)	95	(±1.6)	83	(±2.8)	9	(±2.0)
King Co.†††	97	(±1.7)	88	(±3.4)	94	(±2.3)	95	(±2.2)	96	(±1.9)	84	(±3.8)	9	(±2.9)
West Virginia†††	98	(±1.4)	85	(±3.8)	94	(±2.6)	91	(±3.0)	95	(±2.4)	82	(±3.9)	13	(±3.4)
Wisconsin†††	96	(±1.6)	85	(±2.8)	92	(±2.2)	92	(±2.2)	93	(±1.9)	83	(±2.8)	16	(±2.6)
Milwaukee Co.§§§	96	(±2.1)	78	(±4.4)	90	(±3.2)	93	(±2.7)	89	(±3.5)	79	(±4.3)	16	(±3.8)
Wyoming§§§	94	(±2.5)	80	(±4.2)	90	(±3.1)	87	(±3.5)	92	(±2.8)	74	(±4.3)	9	(±2.9)
U.S. total	**95**	**(±0.4)**	**81**	**(±0.7)**	**91**	**(±0.5)**	**90**	**(±0.5)**	**92**	**(±0.5)**	**83**	**(±0.6)**	**19**	**(±0.6)**

*Children in this period were born during August 1993–November 1995.
† Three or more doses of diphtheria and tetanus toxoids and pertussis vaccine/diphtheria and tetanus toxoids.
§ Four or more doses of DTP/DT.
¶ Three or more doses of poliovirus vaccine.
** One or more doses of measles-containing vaccine.
†† Three or more doses of *Haemophilus influenzae* type b vaccine.
§§ Three or more doses of hepatitis B vaccine.
¶¶ One dose of varicella vaccine on or after the first birthday. Data collection began in July 1996.
*** Confidence interval.
††† Achieved the 1996 Childhood Immunization Initiative (CII) goals for three or more doses of DTP, three or more doses of poliovirus vaccine, one or more doses of MCV, three or more doses of Hib, and three or more doses of hepatitis B vaccine.
§§§ Achieved the 1996 CII goal for three or more doses of hepatitis B vaccine, but did not achieve the goals for at least one of the following: three or more doses of DTP, three or more doses of poliovirus vaccine, one or more doses of MCV, or three or more doses of Hib.

Vaccination Coverage Levels — Continued

TABLE 3. Estimated vaccination coverage with the 4:3:1 series* and the 4:3:1:3 series† among children aged 19–35 months, by coverage level and state — United States, National Immunization Survey, July 1996–June 1997§

Coverage level/State	4:3:1 Series coverage %	(95% CI¶)	Coverage level/State	4:3:1:3 Series coverage %	(95% CI)
≥85%			**≥85%**		
Connecticut	91	(±3.0%)	Connecticut	88	(±3.3%)
Maine	88	(±3.2%)	Maine	85	(±3.5%)
Massachusetts	88	(±2.7%)	Massachusetts	86	(±3.0%)
Minnesota	85	(±3.6%)	**75%–84%**		
Vermont	86	(±3.3%)	Alabama	78	(±3.9%)
75%–84%			Arkansas	75	(±4.6%)
Alabama	80	(±3.7%)	California	75	(±3.1%)
Alaska	76	(±4.8%)	Delaware	79	(±4.7%)
Arkansas	77	(±4.5%)	Florida	77	(±3.7%)
California	77	(±3.0%)	Georgia	80	(±3.5%)
Delaware	81	(±4.6%)	Hawaii	80	(±4.4%)
Florida	78	(±3.6%)	Illinois	76	(±3.6%)
Georgia	81	(±3.4%)	Iowa	80	(±4.0%)
Hawaii	81	(±4.4%)	Kansas	77	(±4.5%)
Illinois	79	(±3.5%)	Kentucky	77	(±4.6%)
Iowa	81	(±3.9%)	Louisiana	82	(±3.7%)
Kansas	79	(±4.4%)	Maryland	78	(±3.7%)
Kentucky	79	(±4.5%)	Minnesota	83	(±3.7%)
Louisiana	83	(±3.6%)	Mississippi	81	(±4.1%)
Maryland	81	(±3.6%)	Montana	78	(±4.2%)
Michigan	76	(±3.6%)	Nebraska	78	(±4.1%)
Mississippi	82	(±4.1%)	New Hampshire	82	(±4.0%)
Missouri	75	(±4.7%)	New Mexico	75	(±4.8%)
Montana	79	(±4.2%)	North Carolina	80	(±4.2%)
Nebraska	81	(±3.9%)	North Dakota	80	(±4.1%)
New Hampshire	83	(±4.0%)	Ohio	75	(±3.5%)
New Jersey	75	(±4.7%)	Pennsylvania	82	(±3.5%)
New Mexico	77	(±4.7%)	Rhode Island	81	(±4.3%)
New York	77	(±3.5%)	South Carolina	82	(±3.9%)
North Carolina	81	(±4.1%)	South Dakota	77	(±4.2%)
North Dakota	82	(±4.0%)	Tennessee	78	(±3.0%)
Ohio	77	(±3.4%)	Vermont	84	(±3.5%)
Pennsylvania	83	(±3.5%)	Virginia	75	(±4.7%)
Rhode Island	84	(±4.0%)	Washington	81	(±3.0%)
South Carolina	84	(±3.8%)	West Virginia	80	(±4.2%)
South Dakota	79	(±4.1%)	Wisconsin	79	(±3.1%)
Tennessee	79	(±3.0%)	**65%–74%**		
Virginia	76	(±4.7%)	Alaska	72	(±5.0%)
Washington	82	(±3.0%)	Arizona	69	(±3.7%)
West Virginia	81	(±4.0%)	Colorado	73	(±5.3%)
Wisconsin	81	(±3.0%)	Idaho	67	(±5.0%)
Wyoming	76	(±4.4%)	Indiana	71	(±3.7%)
65%–74%			Michigan	73	(±3.8%)
Arizona	71	(±3.7%)	Missouri	74	(±4.7%)
Colorado	74	(±5.2%)	Nevada	70	(±5.1%)
Idaho	69	(±5.0%)	New Jersey	73	(±4.8%)
Indiana	73	(±3.7%)	New York	74	(±3.6%)
Nevada	72	(±5.0%)	Oklahoma	69	(±5.2%)
Oklahoma	70	(±5.2%)	Oregon	72	(±4.6%)
Oregon	73	(±4.6%)	Texas	72	(±3.3%)
Texas	73	(±3.2%)	Utah	68	(±4.8%)
Utah	69	(±4.8%)	Wyoming	74	(±4.5%)
U.S. total	**78**	**(±0.7%)**	**U.S. total**	**76**	**(±0.8%)**

* Four or more doses of diphtheria and tetanus toxoids and pertussis vaccine/diphtheria and tetanus toxoids (DTP/DT), three or more doses of poliovirus vaccine, and one or more doses of measles-containing vaccine (MCV).

† Four or more doses of DTP/DT, three or more doses of poliovirus vaccine, one or more doses of MCV, and three or more doses of *Haemophilus influenzae* type b vaccine (Hib).

§ Children in this period were born during August 1993–November 1995.

¶ Confidence interval.

Vaccination Coverage Levels — Continued

TABLE 4. Estimated vaccination coverage with the 4:3:1 series* and the 4:3:1:3 series† among children aged 19–35 months, by coverage level and selected urban area — United States, National Immunization Survey, July 1996–June 1997§

Coverage level/ Urban area	4:3:1 Series coverage %	(95% CI¶)	Coverage level/ Urban area	4:3:1:3 Series coverage %	(95% CI)
≥85%			**≥85%**		
Baltimore, Md.	85	(±4.1%)	King County, Wash.	85	(±3.6%)
Boston, Mass.	85	(±4.1%)	**75%–84%**		
King County, Wash.	86	(±3.6%)	Baltimore, Md.	83	(±4.3%)
75%–84%			Bexar County, Tex.	78	(±4.5%)
Bexar County, Tex.	79	(±4.5%)	Boston, Mass.	83	(±4.3%)
Chicago, Ill.	75	(±5.2%)	Cuyahoga County, Ohio	77	(±4.8%)
Cuyahoga County, Ohio	78	(±4.7%)	Dade County, Fla.	75	(±5.1%)
Dade County, Fla.	77	(±4.9%)	Davidson County, Tenn.	77	(±4.4%)
Davidson County, Tenn.	78	(±4.4%)	Jefferson County, Ala.	76	(±4.8%)
District of Columbia	75	(±5.1%)	Los Angeles County, Calif.	77	(±5.0%)
Franklin County, Ohio	77	(±5.1%)	Marion County, Ind.	78	(±4.8%)
Fulton/DeKalb Counties, Ga.	77	(±5.0%)	Philadelphia County, Pa.	79	(±5.0%)
Jefferson County, Ala.	79	(±4.6%)	San Diego County, Calif.	77	(±4.6%)
Los Angeles County, Calif.	78	(±5.0%)	Santa Clara County, Calif.	76	(±4.6%)
Marion County, Ind.	79	(±4.7%)	**65%–74%**		
New York City, N.Y.	76	(±5.0%)	Chicago, Ill.	71	(±5.4%)
Philadelphia County, Pa.	81	(±4.7%)	Dallas County, Tex.	71	(±5.6%)
San Diego County, Calif.	78	(±4.5%)	District of Columbia	72	(±5.3%)
Santa Clara County, Calif.	79	(±4.4%)	Duval County, Fla.	73	(±5.1%)
65%–74%			Franklin County, Ohio	74	(±5.2%)
Dallas County, Tex.	74	(±5.5%)	Fulton/DeKalb Counties, Ga.	74	(±5.2%)
Detroit, Mich.	67	(±5.3%)	Maricopa County, Ariz.	68	(±5.1%)
Duval County, Fla.	73	(±5.0%)	Milwaukee County, Wis.	70	(±4.8%)
El Paso County, Tex.	67	(±5.3%)	New York City, N.Y.	72	(±5.3%)
Houston, Tex.	65	(±6.0%)	Orleans Parish, La.	70	(±6.1%)
Maricopa County, Ariz.	69	(±5.1%)	Shelby County, Tenn.	67	(±5.3%)
Milwaukee County, Wis.	74	(±4.6%)	**<65%**		
Orleans Parish, La.	71	(±6.0%)	Detroit, Mich.	63	(±5.4%)
Shelby County, Tenn.	69	(±5.2%)	El Paso County, Tex.	64	(±5.4%)
<65%			Houston, Tex.	63	(±6.0%)
Newark, N.J.	63	(±6.0%)	Newark, N.J.	61	(±6.0%)
U.S total	**78**	**(±0.7%)**	**U.S. total**	**76**	**(±0.8%)**

* Four or more doses of diphtheria and tetanus toxoids and pertussis vaccine/diphtheria and tetanus toxoids (DTP/DT), three or more doses of poliovirus vaccine, and one or more doses of measles-containing vaccine (MCV).

† Four or more doses of DTP/DT, three or more doses of poliovirus vaccine, one or more doses of MCV, and three or more doses of *Haemophilus influenzae* type b vaccine (Hib).

§ Children in this period were born during August 1993–November 1995.

¶ Confidence interval.

vaccination coverage. To overcome this apparent leveling in coverage, and to attain the year 2000 objective of 90% coverage with a complete series, vaccination providers must become even more efficient and effective in ensuring full protection of children. Each day, an estimated 11,000 children are born in the United States, and all must receive 12–16 doses of vaccine before the second birthday to be fully vaccinated.

Achievement of the 1996 goals demonstrates that reaching high coverage levels is possible but does not ensure such coverage in the future. Meeting these and other goals at the national, state, and local levels requires a fully functional vaccination delivery system, which remains incomplete in 1998. Important components of this system are state- and community-based computerized vaccination registries, which include all children from birth and can identify children in need of vaccines and recall them for missed vaccinations (*8*); ongoing quality assurance and information

Vaccination Coverage Levels — Continued

feedback activities; continuous education programs for parents and health-care providers, which remain to be fully created and implemented (*9*); and expanding and strengthening the links to the Special Supplemental Nutrition Program for Women, Infants, and Children (*10*). CDC will continue to use NIS to monitor and target efforts to improve vaccination coverage levels in the United States.

References

1. CDC. State and national vaccination coverage levels among children aged 19–35 months—United States, April–December 1994. MMWR 1995;44:613, 619–23.
2. CDC. Status report on the Childhood Immunization Initiative: national, state, and urban area vaccination coverage levels among children aged 19–35 months—United States, 1996. MMWR 1996;46:657–65.
3. CDC. Reported vaccine-preventable diseases—United States, 1993, and the Childhood Immunization Initiative. MMWR 1994;43:57–60.
4. CDC. Sample design and procedures to produce estimates of vaccination coverage in the National Immunization Survey. Atlanta: US Department of Health and Human Services, CDC, 1996.
5. CDC. Hepatitis B virus: a comprehensive strategy for eliminating transmission in the United States through universal childhood vaccination. MMWR 1991;40(no. RR-13).
6. CDC. Varicella-related deaths among adults—United States, 1997. MMWR 1997;46:409–12.
7. CDC. Vaccines for Children Program, 1994. MMWR 1994;43:705.
8. Cordero JF, Orenstein WA. The future of immunization registries. Am J Prev Med 1997; 13(suppl 1):122–4.
9. LeBaron CW, Chaney M, Baughman AL, et al. Impact of measurement and feedback on vaccination coverage in public clinics, 1988–1994. JAMA 1997;277:631–5.
10. Shefer A, Maes E, Brink E, Mize J, Passino JP. Assessment and related immunization issues in the special supplemental nutrition program for women, infants, and children: a status report. J Public Health Management Practice 1996;2:34–44.

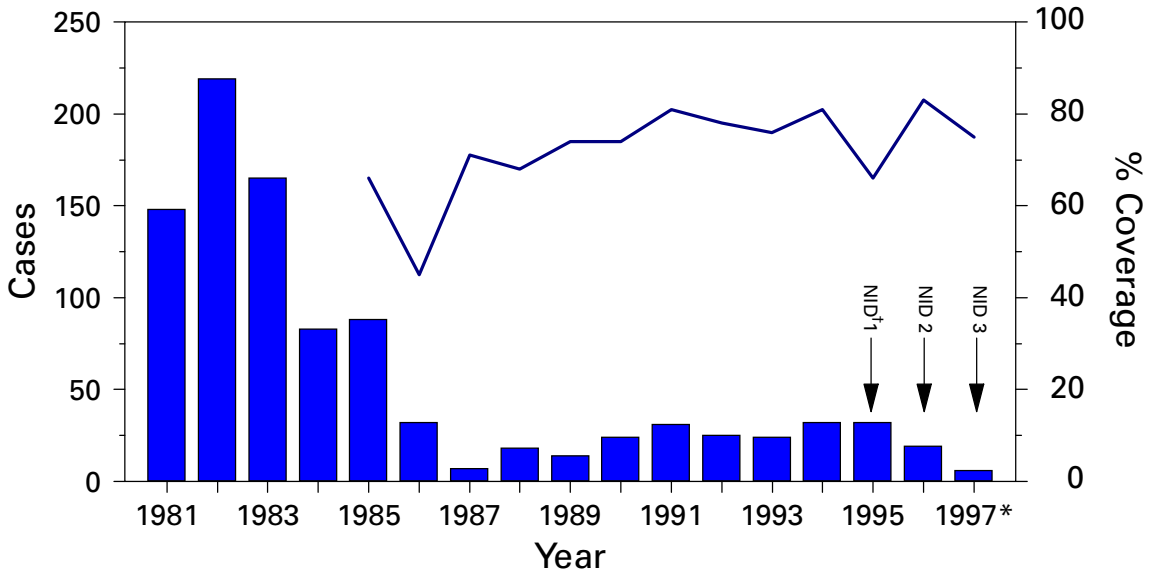
Progress Toward Poliomyelitis Eradication — Turkey, 1994–1997

In 1989, as part of the global poliomyelitis eradication initiative, Turkey adopted the goal of eliminating polio by 2000; since then, substantial progress has been made toward achieving this objective. Turkey is a priority country for the global polio eradication initiative because of its large population (1996 population: 60 million), strategic location between Europe and Asia, and proximity to countries with endemic polio. This report summarizes progress during 1994–1997 in Turkey toward implementing the four polio eradication strategies recommended by the World Health Organization (WHO) (*1*), reviews the cluster of polio cases in 1997, and suggests that recent poliovirus transmission might have resulted from suboptimal vaccination coverage in some areas of Turkey.

Routine Vaccination Coverage. During 1989–1994, reported rates of vaccination coverage with three or more doses of oral poliovirus vaccine (OPV3) in children by age 1 year provided by the routine vaccination program ranged from 74% to 81% (Figure 1). OPV3 coverage declined to 66% in 1995 because of problems with vaccine procurement and increased to 83% in 1996. Based on preliminary data, in 1997 the reported vaccination coverage rate decreased to 75%. Rates differed substantially among the 80 provinces. Eighteen provinces, composing 15% of the total population

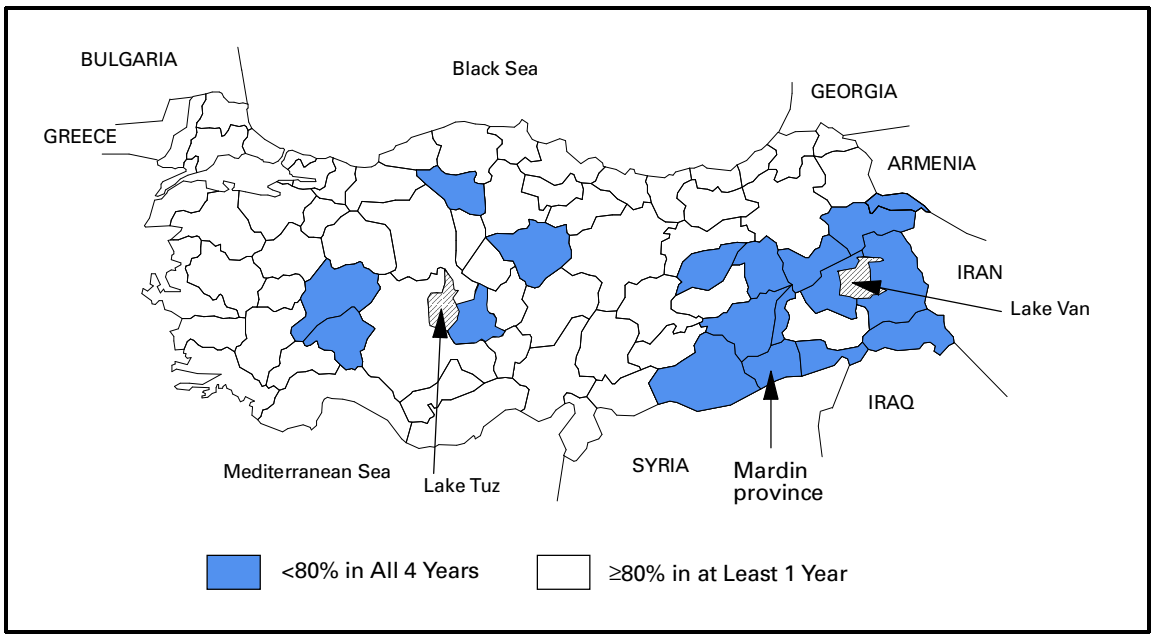
Poliomyelitis Eradication — Continued

FIGURE 1. Reported number of poliomyelitis cases and reported coverage with at least three doses of oral poliovirus vaccine (OPV) among children aged <12 months, by year — Turkey, 1981–1997



*Preliminary data.
†National Immunization Days (NIDs) are mass campaigns over a short period (days to weeks) during which two doses of OPV are administered to all children in the target group regardless of previous vaccination history, with an interval of 4–6 weeks between doses.

FIGURE 2. Routine vaccination coverage with three doses of oral poliovirus vaccine, by province — Turkey, 1994–1997



Poliomyelitis Eradication — Continued

and located primarily in southeastern and eastern Turkey, reported annual coverage rates of <80% (range: 8%–78%) for 1994–1997 (Figure 2).

To improve routine vaccination coverage levels, vaccination activities with OPV, diphtheria-tetanus-pertussis vaccine, and measles vaccine were intensified in the 19 provinces in which coverage rates were low in 1996. As a result, OPV3 coverage among children by age 1 year in the targeted provinces increased from 46% to 60% by the end of 1996.

National Immunization Days. Turkey conducted three National Immunization Days (NIDs)* in 1995, 1996, and 1997 as part of Operation MECACAR (Mediterranean, Caucasus, and Central Asian Republics) (*2,3*), in which 18 geographically contiguous countries in Asia, the Middle East, and Europe synchronized NIDs. NID coverage differed by province and was <80% in six to 11 provinces during 1995–1997. During this period, routine OPV3 coverage and NID coverage for any round did not reach 80% in seven provinces. In 1997, 73% of OPV doses given during NIDs were administered during house-to-house visits.

Surveillance. Acute flaccid paralysis (AFP) surveillance was initiated in Turkey in 1989. Case-based information is passively reported by the provincial health departments to the Ministry of Health in Ankara. Stool specimens obtained from patients with AFP are evaluated at the national reference laboratory in Ankara. The national polio laboratory processes stool specimens to isolate poliovirus and identify poliovirus serotypes. Poliovirus isolates are sent to the regional reference laboratory in the Netherlands for intratypic differentiation of poliovirus as wild or vaccine-related; aliquots of primary stool specimens are shipped for confirmatory testing (*4*).

In 1997, WHO began accrediting national polio laboratories in Europe to be formally recognized as members of the Global Laboratory Network. Accreditation includes a proficiency test panel of prepared specimens, with a target score of 80% (*4*). The Turkish national polio laboratory achieved a perfect score of 100% in this proficiency testing. Full accreditation by WHO, anticipated in 1998, will require additional technical improvements.

An important performance indicator for adequate AFP surveillance is the annual reported rate of nonpolio AFP cases per 100,000 children aged <15 years (target: ≥1 case per 100,000) (*1*). In Turkey, the nonpolio AFP rate was 0.3 in 1994, 0.5 in 1995, 0.4 in 1996, and 0.6 in 1997 (preliminary data). The increase in 1997 occurred primarily because a larger number of provinces (26 in 1997 versus 10 in 1996) achieved a rate of ≥1 case. However, 39 (49%) of 80 provinces, constituting one third of the total population, did not report AFP cases. Four of these provinces are small, and an AFP case would not be expected every year; however, the remaining 35 provinces would be expected to report at least 63 nonpolio AFP cases annually.

The second important surveillance quality indicator is the proportion of patients with AFP from whom two adequate stool specimens are obtained.† In Turkey, the proportion of AFP cases for which two adequate stool specimens were evaluated was 16% in 1994, 45% in 1995, 36% in 1996, and 65% in 1997 (preliminary data).

---

*Mass campaigns over a short period (days to weeks) in which two doses of OPV are administered to all children in the target age group, regardless of previous vaccination history, with an interval of 4–6 weeks between doses.

†Two stool specimens collected at an interval of at least 24 hours within 14 days of onset of paralysis. WHO recommends that ≥80% of patients with AFP should have two adequate specimens collected (*1*).

Poliomyelitis Eradication — Continued

Other Supplementary Immunization Activities. Before conducting NIDs, vaccination campaigns were conducted in 1994 in two provinces following the detection of wild polioviruses. During these campaigns, in which children aged <5 years were targeted for vaccination regardless of their previous vaccination status, vaccination coverage rates were ≥94%.

In October and November 1997, Turkey conducted two rounds of "mopping-up" vaccination[§] in 28 provinces with either low routine vaccination coverage (<80% OPV3 coverage since 1995), poor AFP surveillance (i.e., no reporting of cases since 1995), or increased risk for poliovirus importation from neighboring countries with endemic polio. Reported coverage in the first and second rounds of the mopping-up campaign, targeting 20% of the total population, was 84% and 84%, respectively. However, supplemental vaccination coverage for the first round was <80% in seven (25%) participating provinces.

Polio Incidence

In Turkey, the number of reported polio cases confirmed by the standard WHO clinical case definition[¶] has decreased under conditions of improved surveillance since 1994 (32 in 1994, 32 in 1995, and 19 in 1996) (Figure 1). In 1994, wild poliovirus type 1 (P1) was isolated from seven patients located in five provinces of the southeastern and western regions of the country. Two distinct genotypes of P1 were identified by genomic sequencing analysis. In 1995, wild poliovirus type 3 (P3) was isolated in a northwestern province. In 1996, no wild poliovirus was isolated.

In 1997, a total of 141 AFP cases were reported from Turkey; six AFP cases were confirmed as polio by wild P1 isolation, the first wild P1 isolated since 1994. The virologically confirmed cases had onset of paralysis during July 23–October 10, 1997; these cases occurred in patients from Mardin province (Figure 2). All six patients were aged 9 months–2 years; four patients were unvaccinated, and two had received only one dose of OPV. Genomic sequencing of the viral isolates from the 1997 cluster indicated a distinct relation with wild P1 isolates obtained from eastern Turkey in 1994. Routine vaccination coverage in Mardin has been <50% since 1994, although reported coverage was ≥78% for all NID rounds. Coverage rates for the two rounds of mopping-up vaccination in Mardin in 1997 were 80% and 65%, respectively. No additional polio cases have been detected from Mardin or other provinces in Turkey.

Reported by: S Tumay, MD, N Satirlar, MD, O Afsar, MD, B Altay, MD, N Noyan, MD, A Ozkan, MD, S Caglayan, MD, Div of Primary Health Care Svcs; I Alaeddinoglu, C Artuk, E Ozkaya, MD, National Polio Laboratory, Ministry of Health, Turkey. Communicable Diseases and Immunization Unit, European Regional Office, World Health Organization, Copenhagen, Denmark; Global Programme for Vaccines and Immunization, World Health Organization, Geneva, Switzerland. Respiratory and Enteric Viruses Br, Div of Viral and Rickettsial Diseases, National Center for Infectious Diseases; Vaccine Preventable Disease Eradication Div, National Immunization Program, CDC.

Editorial Note: Turkey has made substantial progress in polio eradication activities since 1989. The number of reported polio cases declined substantially after implementation of NIDs, and no wild polioviruses were isolated from June 1995 through June 1997. During July–October 1997, a cluster of virologically confirmed cases occurred in

[§]Focal mass campaign in high-risk areas over a short period (days to weeks) in which two doses of OPV are administered during house-to-house visits to all children in the target age group, regardless of previous vaccination history, with an interval of 4–6 weeks between doses.

[¶]A confirmed case of polio is defined as AFP and at least one of the following: 1) laboratory-confirmed wild poliovirus infection, 2) residual paralysis at 60 days, 3) death, or 4) no follow-up investigation at 60 days.

Poliomyelitis Eradication — Continued

one province. This cluster emphasizes the importance of establishing effective AFP surveillance, maintaining high routine vaccination coverage, achieving high levels of coverage during NIDs, and implementing mopping-up campaigns in high-risk areas to limit poliovirus transmission. Wild poliovirus identified in this cluster was either indigenous virus, which may have continued to circulate undetected because of limited AFP surveillance, or wild virus originating from a neighboring country in which polio is endemic (*5*). The source of the wild poliovirus in this cluster could not be determined, and no virus isolates were available from recent cases in neighboring countries to enable molecular epidemiologic analysis of poliovirus circulation.

As a result of this cluster and the outcome of past vaccination efforts, the Ministry of Health has strengthened all aspects of the national polio eradication effort. NIDs will be conducted in the spring of 1998, and mopping-up vaccination campaigns are being considered. Efforts are under way to improve routine vaccination coverage in the geographic area where wild polioviruses were detected and in all other provinces where coverage has been consistently low.

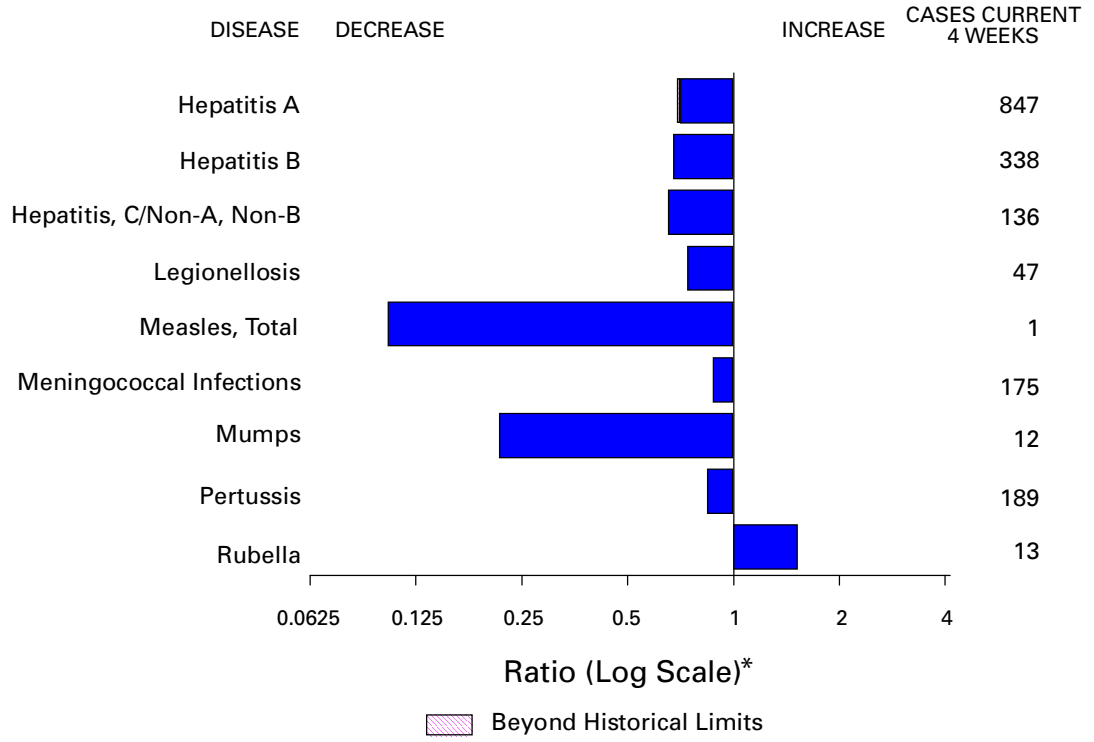
Improving AFP surveillance in all provinces is a high priority. Efforts to improve AFP surveillance include 1) additional training of public health staff at the provincial and district levels; 2) establishing and maintaining active surveillance by regularly reviewing hospital records and contacting health-care providers in major clinics and hospitals; 3) establishing a strong relation with national and local organizations of health-care providers who are likely to treat patients with AFP; 4) augmenting laboratory equipment, supplies, and procedures; and 5) improving coordination between the laboratory and surveillance staff.

In 1997, a year with a historically low number of reported cases in the European Region of WHO, Turkey was the only country in which wild poliovirus transmission was detected (*3*). The European Region can be certified as free of indigenous wild poliovirus transmission only after no wild poliovirus has been detected for at least 3 consecutive years in the presence of high-quality AFP surveillance. The WHO Regional Offices for Europe and the Eastern Mediterranean continue to coordinate polio eradication activities that began in 1995 with the synchronized mass vaccination activities of Operation MECACAR (*3,5*) and will include simultaneous "mopping-up" and catch-up vaccination campaigns. NIDs will be coordinated between several bordering countries in the Middle East, Caucasus, and Central Asian Republics during Operation MECACAR Plus, which will be held during March–May 1998. National governments are working in cooperation with the major partner agencies contributing to the polio-eradication initiative (e.g., WHO, Rotary International, United Nations Children's Fund [UNICEF], U.S. Agency for International Development, and CDC) toward achieving the goal of global polio eradication by the year 2000.

References

1. CDC. Progress toward global eradication of poliomyelitis, 1996. MMWR 1997;46:579–84.
2. CDC. Mass vaccination with oral poliovirus vaccine—Asia and Europe, 1995. MMWR 1995;44: 234–6.
3. CDC. Progress toward poliomyelitis eradication—Europe and Central Asian Republics, 1991–September 1997. MMWR 1997;46:994–1000.
4. CDC. Status of the global laboratory network for poliomyelitis eradication, 1994–1996. MMWR 1997;46:692–4.
5. CDC. Progress toward poliomyelitis eradication—Eastern Mediterannean Region, 1996–1997. MMWR 1997;46:793–7.

FIGURE I. Selected notifiable disease reports, comparison of provisional 4-week totals ending February 14, 1998, with historical data — United States



*Ratio of current 4-week total to mean of 15 4-week totals (from previous, comparable, and subsequent 4-week periods for the past 5 years). The point where the hatched area begins is based on the mean and two standard deviations of these 4-week totals.

TABLE I. Summary — provisional cases of selected notifiable diseases, United States, cumulative, week ending February 14, 1998 (6th Week)

	Cum. 1998		Cum. 1998
Anthrax	-	Plague	-
Brucellosis	3	Poliomyelitis, paralytic[¶]	-
Cholera	-	Psittacosis	6
Congenital rubella syndrome	-	Rabies, human	-
Cryptosporidiosis*	141	Rocky Mountain spotted fever (RMSF)	7
Diphtheria	-	Streptococcal disease, invasive Group A	168
Encephalitis: California*	2	Streptococcal toxic-shock syndrome*	9
eastern equine*	-	Syphilis, congenital**	-
St. Louis*	-	Tetanus	1
western equine*	-	Toxic-shock syndrome	10
Hansen Disease	9	Trichinosis	1
Hantavirus pulmonary syndrome*[†]	-	Typhoid fever	29
Hemolytic uremic syndrome, post-diarrheal*	1	Yellow fever	-
HIV infection, pediatric*[§]	22		

-:no reported cases
*Not notifiable in all states.
[†] Updated weekly from reports to the Division of Viral and Rickettsial Diseases, National Center for Infectious Diseases (NCID).
[§] Updated monthly to the Division of HIV/AIDS Prevention–Surveillance and Epidemiology, National Center for HIV, STD, and TB Prevention (NCHSTP), last update January 15, 1998.
[¶] One suspected case of polio with onset in 1998 has also been reported to date.
**Updated from reports to the Division of STD Prevention, NCHSTP.

TABLE II. Provisional cases of selected notifiable diseases, United States, weeks ending February 14, 1998, and February 8, 1997 (6th Week)

Reporting Area	AIDS		Chlamydia		*Escherichia coli* O157:H7		Gonorrhea		Hepatitis C/NA,NB	
					NETSS†	PHLIS§				
	Cum. 1998*	Cum. 1997	Cum. 1998	Cum. 1997	Cum. 1998	Cum. 1998	Cum. 1998	Cum. 1997	Cum. 1998	Cum. 1997
UNITED STATES	3,171	5,933	42,645	45,337	71	21	29,229	30,842	201	283
NEW ENGLAND	64	133	2,089	1,897	8	5	593	686	1	5
Maine	2	13	117	75	-	-	7	4	-	-
N.H.	-	1	77	95	2	2	11	29	-	-
Vt.	5	7	32	42	-	-	1	8	-	-
Mass.	6	61	1,025	845	5	3	265	280	1	5
R.I.	12	19	290	230	1	-	43	57	-	-
Conn.	39	32	548	610	-	-	266	308	-	-
MID. ATLANTIC	902	1,925	5,588	5,693	2	-	3,354	3,732	22	21
Upstate N.Y.	114	117	N	N	2	-	190	580	20	12
N.Y. City	490	1,033	3,292	3,049	-	-	1,643	1,512	-	-
N.J.	135	473	117	1,180	-	-	377	771	-	-
Pa.	163	302	2,179	1,464	N	-	1,144	869	2	9
E.N. CENTRAL	203	373	8,542	7,483	16	2	6,853	4,938	48	74
Ohio	32	92	2,801	2,524	6	-	1,765	1,708	3	4
Ind.	39	25	981	854	5	-	720	672	1	1
Ill.	102	115	2,143	1,256	5	-	1,943	625	1	10
Mich.	15	118	2,391	1,558	-	-	2,304	1,366	43	59
Wis.	15	23	226	1,291	N	3	121	567	-	-
W.N. CENTRAL	55	187	2,594	3,418	5	3	987	1,469	4	13
Minn.	15	17	482	815	3	4	213	292	-	-
Iowa	6	36	39	606	1	-	13	158	3	1
Mo.	19	112	1,167	1,143	-	1	439	710	1	9
N. Dak.	-	2	1	105	-	-	1	6	-	1
S. Dak.	4	-	199	110	-	-	27	15	-	-
Nebr.	9	13	77	186	-	-	13	63	-	-
Kans.	2	7	629	453	1	-	281	225	-	2
S. ATLANTIC	793	1,543	10,437	8,743	16	1	8,991	9,527	14	21
Del.	13	20	228	-	-	-	175	120	-	-
Md.	53	179	802	576	8	1	839	1,431	2	3
D.C.	83	117	N	N	-	-	405	618	-	-
Va.	39	131	1,382	1,173	N	-	886	952	1	-
W. Va.	5	14	363	420	N	-	105	129	-	-
N.C.	45	59	2,030	2,236	4	-	1,764	1,926	4	8
S.C.	59	104	2,065	1,412	-	-	1,472	1,500	-	9
Ga.	116	187	1,900	648	2	-	1,931	979	-	-
Fla.	380	732	1,667	2,278	2	-	1,414	1,872	7	1
E.S. CENTRAL	156	134	3,937	3,675	2	1	4,167	4,138	9	26
Ky.	19	23	665	691	1	-	451	500	-	-
Tenn.	52	58	1,550	1,275	-	1	1,479	1,223	8	11
Ala.	56	38	1,132	944	1	-	1,603	1,399	1	1
Miss.	29	15	590	765	-	1	634	1,016	-	14
W.S. CENTRAL	382	442	2,560	4,511	-	-	2,244	3,480	-	20
Ark.	17	18	314	296	-	-	589	506	-	-
La.	67	85	1,392	630	-	-	1,154	762	-	14
Okla.	14	32	854	557	-	-	501	501	-	-
Tex.	284	307	-	3,028	-	-	-	1,711	-	6
MOUNTAIN	88	139	1,953	2,335	6	4	838	802	60	36
Mont.	6	7	82	85	-	-	4	6	3	2
Idaho	3	2	33	158	2	-	-	15	14	9
Wyo.	-	1	82	59	-	-	6	6	34	13
Colo.	21	38	-	129	1	1	347	224	3	5
N. Mex.	9	4	496	485	2	1	92	99	2	3
Ariz.	33	28	1,035	972	N	2	361	332	-	3
Utah	13	16	215	137	1	-	25	18	3	-
Nev.	3	43	10	310	-	-	3	102	1	1
PACIFIC	528	1,057	4,945	7,582	16	5	1,202	2,070	43	67
Wash.	34	45	1,189	994	-	-	212	263	1	-
Oreg.	12	30	279	462	5	2	48	77	1	1
Calif.	477	961	3,108	5,818	11	4	874	1,616	17	46
Alaska	-	16	167	160	-	-	29	64	-	-
Hawaii	5	5	202	148	N	-	39	50	24	20
Guam	-	-	8	31	N	-	2	3	-	-
P.R.	88	144	U	U	1	U	49	63	2	6
V.I.	1	4	N	N	N	U	-	-	-	-
Amer. Samoa	-	-	-	-	N	U	-	-	-	-
C.N.M.I.	-	-	N	N	N	U	5	4	-	1

N: Not notifiable U: Unavailable -: no reported cases C.N.M.I.: Commonwealth of Northern Mariana Islands

*Updated monthly to the Division of HIV/AIDS Prevention–Surveillance and Epidemiology, National Center for HIV, STD, and TB Prevention, last update January 25, 1998.

†National Electronic Telecommunications System for Surveillance.

§Public Health Laboratory Information System.

TABLE II. (Cont'd.) Provisional cases of selected notifiable diseases, United States, weeks ending February 14, 1998, and February 8, 1997 (6th Week)

Reporting Area	Legionellosis		Lyme Disease		Malaria		Syphilis (Primary & Secondary)		Tuberculosis		Rabies, Animal
	Cum. 1998	Cum. 1997	Cum. 1998	Cum. 1997	Cum. 1998	Cum. 1997	Cum. 1998	Cum. 1997	Cum. 1998*	Cum. 1997	Cum. 1998
UNITED STATES	83	104	197	337	81	134	668	1,041	443	1,112	637
NEW ENGLAND	6	7	15	72	1	3	10	12	16	21	118
Maine	-	-	-	-	-	-	-	-	U	2	15
N.H.	1	2	-	3	-	1	-	-	-	-	11
Vt.	-	1	-	2	-	-	-	-	-	-	3
Mass.	2	3	13	8	1	1	10	5	12	6	38
R.I.	3	-	2	7	-	1	-	-	4	3	12
Conn.	-	1	-	52	-	-	-	7	U	10	39
MID. ATLANTIC	13	17	107	221	19	23	18	47	27	116	182
Upstate N.Y.	6	4	28	16	8	1	1	8	U	10	111
N.Y. City	-	-	-	14	8	10	4	10	U	65	U
N.J.	-	2	-	72	-	10	-	21	27	23	27
Pa.	7	11	79	119	3	2	13	8	U	18	44
E.N. CENTRAL	24	47	14	1	5	13	86	98	31	145	3
Ohio	16	27	14	-	1	1	29	30	5	41	3
Ind.	2	3	-	-	1	2	8	22	U	13	-
Ill.	-	1	-	1	-	5	30	14	26	89	-
Mich.	6	15	-	-	3	5	15	14	U	-	-
Wis.	-	1	U	U	-	-	4	18	U	2	-
W.N. CENTRAL	6	6	1	-	1	1	10	27	11	25	51
Minn.	-	-	-	-	-	-	-	7	U	13	9
Iowa	-	-	1	-	1	1	-	1	U	4	18
Mo.	4	3	-	-	-	-	7	14	11	6	1
N. Dak.	-	-	-	-	-	-	-	-	U	1	17
S. Dak.	-	-	-	-	-	-	-	-	-	1	-
Nebr.	2	2	-	-	-	-	-	-	-	-	-
Kans.	-	1	-	-	-	-	3	5	U	-	6
S. ATLANTIC	17	9	49	28	28	27	294	402	84	98	223
Del.	1	1	-	2	1	1	-	3	-	2	-
Md.	4	6	45	22	13	7	57	121	17	13	64
D.C.	2	1	2	3	3	2	7	14	13	6	-
Va.	2	-	-	-	2	8	32	27	5	16	54
W. Va.	N	N	-	-	-	-	-	-	9	6	7
N.C.	3	-	-	1	3	1	77	83	40	24	39
S.C.	1	-	-	-	-	3	38	51	U	2	9
Ga.	-	-	2	-	4	3	57	75	U	23	23
Fla.	4	1	-	-	2	2	26	28	U	6	27
E.S. CENTRAL	1	4	6	10	2	5	132	229	-	84	17
Ky.	-	-	-	1	-	1	13	13	U	14	1
Tenn.	1	1	5	2	1	1	71	89	U	29	8
Ala.	-	1	1	-	1	1	35	64	U	32	8
Miss.	-	2	-	7	-	2	13	63	U	9	-
W.S. CENTRAL	-	-	-	-	2	-	74	164	-	156	22
Ark.	-	-	-	-	-	-	21	25	-	11	1
La.	-	-	-	-	2	-	46	62	-	-	-
Okla.	-	-	-	-	-	-	7	20	U	14	21
Tex.	-	-	-	-	-	-	-	57	U	131	-
MOUNTAIN	7	9	-	-	7	9	26	24	22	18	8
Mont.	-	-	-	-	-	1	-	-	-	-	3
Idaho	-	-	-	-	-	-	-	-	-	-	-
Wyo.	-	-	-	-	-	-	-	-	-	1	5
Colo.	2	3	-	-	3	5	2	-	U	3	-
N. Mex.	1	-	-	-	3	-	-	-	6	-	-
Ariz.	-	3	-	-	-	-	22	21	14	10	-
Utah	4	2	-	-	1	-	2	-	2	1	-
Nev.	-	1	-	-	-	3	-	3	U	3	-
PACIFIC	9	5	5	5	16	53	18	38	252	449	13
Wash.	-	1	-	-	-	-	1	-	U	28	-
Oreg.	-	-	-	2	3	2	1	1	U	14	-
Calif.	9	3	5	3	13	51	16	37	239	371	11
Alaska	-	-	-	-	-	-	-	-	4	11	2
Hawaii	-	1	-	-	-	-	-	-	9	25	-
Guam	-	-	-	-	-	-	-	-	-	5	-
P.R.	-	-	-	-	-	2	26	28	-	-	5
V.I.	-	-	-	-	-	-	-	-	-	-	-
Amer. Samoa	-	-	-	-	-	-	-	-	-	-	-
C.N.M.I.	-	-	-	-	-	-	1	-	4	-	-

N: Not notifiable U: Unavailable -: no reported cases

*Additional information about areas displaying "U" (e.g., Tuberculosis) can be found in Notices to Readers, *MMWR* Vol. 47, No. 2, p. 39.

TABLE III. Provisional cases of selected notifiable diseases preventable by vaccination, United States, weeks ending February 14, 1998, and February 8, 1997 (6th Week)

Reporting Area	*H. influenzae*, invasive		Hepatitis (Viral), by type				Measles (Rubeola)					
			A		B		Indigenous		Imported†		Total	
	Cum. 1998*	Cum. 1997	Cum. 1998	Cum. 1997	Cum. 1998	Cum. 1997	1998	Cum. 1998	1998	Cum. 1998	Cum. 1998	Cum. 1997
UNITED STATES	107	116	1,523	2,637	562	784	-	-	-	2	2	11
NEW ENGLAND	8	11	33	61	4	21	-	-	-	1	1	-
Maine	-	2	7	2	-	1	-	-	-	-	-	-
N.H.	1	2	1	1	2	1	-	-	-	-	-	-
Vt.	-	-	1	3	-	1	-	-	-	-	-	-
Mass.	7	6	4	28	-	13	-	-	-	1	1	-
R.I.	-	1	4	2	2	1	-	-	-	-	-	-
Conn.	-	-	16	25	-	4	-	-	-	-	-	-
MID. ATLANTIC	12	18	62	246	67	130	-	-	-	1	1	4
Upstate N.Y.	4	1	32	11	25	13	-	-	-	1	1	2
N.Y. City	1	6	16	120	17	56	-	-	-	-	-	1
N.J.	7	8	2	49	-	28	-	-	-	-	-	1
Pa.	-	3	12	66	25	33	-	-	-	-	-	-
E.N. CENTRAL	12	17	245	316	82	148	-	-	-	-	-	1
Ohio	9	11	55	66	10	12	-	-	-	-	-	-
Ind.	2	-	32	29	5	18	-	-	-	-	-	-
Ill.	-	5	3	113	1	48	-	-	-	-	-	-
Mich.	-	1	147	76	65	64	-	-	-	-	-	1
Wis.	1	-	8	32	1	6	-	-	-	-	-	-
W.N. CENTRAL	2	4	170	179	28	55	-	-	-	-	-	-
Minn.	-	2	5	1	2	-	-	-	-	-	-	-
Iowa	1	-	73	28	5	3	-	-	-	-	-	-
Mo.	1	2	86	108	18	45	-	-	-	-	-	-
N. Dak.	-	-	-	-	-	-	-	-	-	-	-	-
S. Dak.	-	-	1	5	1	-	-	-	-	-	-	-
Nebr.	-	-	3	7	-	2	-	-	-	-	-	-
Kans.	-	-	2	30	2	5	U	-	U	-	-	-
S. ATLANTIC	30	21	145	161	77	73	-	-	-	-	-	-
Del.	-	-	-	6	-	1	-	-	-	-	-	-
Md.	8	7	41	53	12	23	-	-	-	-	-	-
D.C.	-	-	5	3	1	6	-	-	-	-	-	-
Va.	3	1	19	18	5	9	-	-	-	-	-	-
W. Va.	1	1	-	1	-	2	-	-	-	-	-	-
N.C.	1	5	10	22	28	16	-	-	-	-	-	-
S.C.	-	2	5	10	-	7	-	-	-	-	-	-
Ga.	7	2	26	23	12	-	-	-	-	-	-	-
Fla.	10	3	39	25	19	9	-	-	-	-	-	-
E.S. CENTRAL	4	11	30	80	43	64	-	-	-	-	-	1
Ky.	-	-	-	15	-	2	-	-	-	-	-	-
Tenn.	4	6	17	37	32	47	-	-	-	-	-	-
Ala.	-	5	13	11	11	5	-	-	-	-	-	1
Miss.	-	-	-	17	-	10	U	-	U	-	-	-
W.S. CENTRAL	7	5	57	227	13	14	-	-	-	-	-	-
Ark.	-	-	1	23	8	4	-	-	-	-	-	-
La.	3	-	3	2	2	3	-	-	-	-	-	-
Okla.	3	4	46	152	3	-	-	-	-	-	-	-
Tex.	1	1	7	50	-	7	U	-	U	-	-	-
MOUNTAIN	23	7	364	470	101	95	-	-	-	-	-	-
Mont.	-	-	6	14	1	-	-	-	-	-	-	-
Idaho	-	-	23	24	3	-	-	-	-	-	-	-
Wyo.	-	-	4	3	3	2	-	-	-	-	-	-
Colo.	1	1	36	69	13	26	-	-	-	-	-	-
N. Mex.	-	1	24	25	34	31	-	-	-	-	-	-
Ariz.	15	2	224	185	30	20	-	-	-	-	-	-
Utah	2	1	25	118	8	11	-	-	-	-	-	-
Nev.	5	2	22	32	9	5	U	-	U	-	-	-
PACIFIC	9	22	417	897	147	184	-	-	-	-	-	5
Wash.	-	-	42	26	14	3	-	-	-	-	-	-
Oreg.	8	5	41	57	12	14	-	-	-	-	-	-
Calif.	-	15	331	799	119	161	-	-	-	-	-	2
Alaska	-	-	-	4	1	3	-	-	-	-	-	-
Hawaii	1	2	3	11	1	3	-	-	-	-	-	3
Guam	-	-	-	-	-	1	U	-	U	-	-	-
P.R.	-	-	-	22	8	55	-	-	-	-	-	-
V.I.	-	-	-	-	-	-	U	-	U	-	-	-
Amer. Samoa	-	-	-	-	-	-	U	-	U	-	-	-
C.N.M.I.	-	2	-	1	3	5	U	-	U	-	-	-

N: Not notifiable U: Unavailable -: no reported cases

*Of 21 cases among children aged <5 years, serotype was reported for 10 and of those, 5 were type b.

†For imported measles, cases include only those resulting from importation from other countries.

TABLE III. (Cont'd.) Provisional cases of selected notifiable diseases preventable by vaccination, United States, weeks ending February 14, 1998, and February 8, 1997 (6th Week)

Reporting Area	Meningococcal Disease		Mumps			Pertussis			Rubella		
	Cum. 1998	Cum. 1997	1998	Cum. 1998	Cum. 1997	1998	Cum. 1998	Cum. 1997	1998	Cum. 1998	Cum. 1997
UNITED STATES	311	447	-	28	40	61	363	515	2	14	5
NEW ENGLAND	26	30	-	-	-	1	72	181	-	-	-
Maine	1	2	-	-	-	-	4	4	-	-	-
N.H.	1	3	-	-	-	-	5	22	-	-	-
Vt.	1	-	-	-	-	1	14	69	-	-	-
Mass.	10	20	-	-	-	-	49	86	-	-	-
R.I.	3	1	-	-	-	-	-	-	-	-	-
Conn.	10	4	-	-	-	-	-	-	-	-	-
MID. ATLANTIC	27	35	-	1	4	5	26	27	-	10	1
Upstate N.Y.	9	6	-	1	-	5	26	15	-	10	-
N.Y. City	3	5	-	-	-	-	-	7	-	-	1
N.J.	15	5	-	-	2	-	-	2	-	-	-
Pa.	-	19	-	-	2	-	-	3	-	-	-
E.N. CENTRAL	39	71	-	4	7	5	31	61	-	-	3
Ohio	26	30	-	3	2	5	23	30	-	-	-
Ind.	6	9	-	-	2	-	1	-	-	-	-
Ill.	-	20	-	-	1	-	-	6	-	-	-
Mich.	4	5	-	1	2	-	7	16	-	-	-
Wis.	3	7	-	-	-	-	-	9	-	-	3
W.N. CENTRAL	18	37	-	-	2	15	26	14	-	-	-
Minn.	-	2	-	-	-	12	18	3	-	-	-
Iowa	3	10	-	-	2	3	6	4	-	-	-
Mo.	7	16	-	-	-	-	-	-	-	-	-
N. Dak.	-	-	-	-	-	-	-	1	-	-	-
S. Dak.	3	1	-	-	-	-	-	1	-	-	-
Nebr.	1	3	-	-	-	-	2	2	-	-	-
Kans.	4	5	U	-	-	U	-	3	U	-	-
S. ATLANTIC	64	76	-	9	1	9	38	27	-	1	-
Del.	-	2	-	-	-	-	-	-	-	-	-
Md.	8	9	-	2	-	-	6	22	-	-	-
D.C.	-	2	-	-	-	-	-	2	-	-	-
Va.	7	4	-	-	-	-	-	-	-	-	-
W. Va.	2	3	-	-	-	-	-	-	-	-	-
N.C.	8	16	-	4	-	-	23	-	-	1	-
S.C.	5	17	-	2	-	-	-	2	-	-	-
Ga.	22	12	-	-	-	-	-	-	-	-	-
Fla.	12	11	-	1	1	9	9	1	-	-	-
E.S. CENTRAL	14	43	-	-	6	1	11	13	-	-	-
Ky.	-	9	-	-	-	-	-	2	-	-	-
Tenn.	14	16	-	-	2	1	3	3	-	-	-
Ala.	-	13	-	-	2	-	8	5	-	-	-
Miss.	-	5	U	-	2	U	-	3	U	-	-
W.S. CENTRAL	17	14	-	5	3	-	12	5	-	1	-
Ark.	2	4	-	-	-	-	6	2	-	-	-
La.	4	1	-	-	-	-	-	-	-	-	-
Okla.	11	2	-	-	-	-	-	-	-	-	-
Tex.	-	7	U	5	3	U	6	3	U	1	-
MOUNTAIN	26	28	-	1	4	23	132	117	2	2	-
Mont.	1	1	-	-	-	-	1	-	-	-	-
Idaho	-	2	-	-	-	19	78	75	-	-	-
Wyo.	1	-	-	-	-	-	-	3	-	-	-
Colo.	11	2	-	-	1	2	12	27	-	-	-
N. Mex.	4	8	N	N	N	2	36	7	-	-	-
Ariz.	8	8	-	1	-	-	-	4	-	-	-
Utah	1	3	-	-	1	-	4	-	2	2	-
Nev.	-	4	U	-	2	U	1	1	U	-	-
PACIFIC	80	113	-	8	13	2	15	70	-	-	1
Wash.	12	9	-	-	2	2	7	13	-	-	-
Oreg.	27	30	N	N	N	-	8	4	-	-	-
Calif.	41	74	-	2	7	-	-	51	-	-	1
Alaska	-	-	-	2	-	-	-	1	-	-	-
Hawaii	-	-	-	4	4	-	-	1	-	-	-
Guam	-	-	U	-	1	U	-	-	U	-	-
P.R.	-	2	-	-	2	-	-	-	-	-	-
V.I.	-	-	U	-	-	U	-	-	U	-	-
Amer. Samoa	-	-	U	-	-	U	-	-	U	-	-
C.N.M.I.	-	-	U	-	-	U	-	-	U	-	-

N: Not notifiable U: Unavailable -: no reported cases

TABLE IV. Deaths in 122 U.S. cities,* week ending February 14, 1998 (6th Week)

Reporting Area	All Causes, By Age (Years)						P&I† Total
	All Ages	>65	45-64	25-44	1-24	<1	
NEW ENGLAND	579	448	88	27	13	3	74
Boston, Mass.	163	120	23	15	5	-	26
Bridgeport, Conn.	51	37	11	-	2	1	4
Cambridge, Mass.	32	25	7	-	-	-	5
Fall River, Mass.	34	31	3	-	-	-	3
Hartford, Conn.	U	U	U	U	U	U	U
Lowell, Mass.	34	29	3	2	-	-	7
Lynn, Mass.	11	9	2	-	-	-	2
New Bedford, Mass.	22	21	1	-	-	-	2
New Haven, Conn.	38	24	10	2	1	1	2
Providence, R.I.	55	41	13	-	1	-	-
Somerville, Mass.	-	-	-	-	-	-	-
Springfield, Mass.	57	44	7	3	2	1	6
Waterbury, Conn.	U	U	U	U	U	U	U
Worcester, Mass.	82	67	8	5	2	-	17
MID. ATLANTIC	2,253	1,632	398	161	32	30	125
Albany, N.Y.	48	39	4	3	1	1	2
Allentown, Pa.	28	24	4	-	-	-	1
Buffalo, N.Y.	68	49	14	2	1	2	2
Camden, N.J.	26	19	2	3	1	1	1
Elizabeth, N.J.	19	14	3	2	-	-	-
Erie, Pa.	61	51	8	2	-	-	7
Jersey City, N.J.	39	27	6	4	-	2	-
New York City, N.Y.	1,221	873	217	96	16	19	48
Newark, N.J.	62	32	17	12	1	-	1
Paterson, N.J.	27	17	6	2	2	-	-
Philadelphia, Pa.	200	129	48	19	3	1	8
Pittsburgh, Pa.§	81	63	10	4	4	-	7
Reading, Pa.	40	34	4	1	-	1	6
Rochester, N.Y.	123	98	19	4	1	1	12
Schenectady, N.Y.	17	13	3	1	-	-	4
Scranton, Pa.	25	20	5	-	-	-	4
Syracuse, N.Y.	91	72	14	2	1	2	15
Trenton, N.J.	27	18	6	3	-	-	3
Utica, N.Y.	19	17	2	-	-	-	1
Yonkers, N.Y.	31	23	6	1	1	-	3
E.N. CENTRAL	2,317	1,642	421	149	46	58	147
Akron, Ohio	77	59	12	5	1	-	1
Canton, Ohio	32	28	3	1	-	-	4
Chicago, Ill.	378	248	76	38	8	7	25
Cincinnati, Ohio	114	86	18	2	2	6	14
Cleveland, Ohio	159	104	39	8	4	4	1
Columbus, Ohio	219	148	46	17	3	5	22
Dayton, Ohio	149	110	26	8	1	4	10
Detroit, Mich.	207	130	45	22	7	3	9
Evansville, Ind.	69	58	6	2	1	2	3
Fort Wayne, Ind.	69	48	13	5	1	2	3
Gary, Ind.	21	12	4	4	1	-	-
Grand Rapids, Mich.	67	51	6	3	1	6	7
Indianapolis, Ind.	222	157	37	12	8	8	-
Lansing, Mich.	40	31	7	1	1	-	3
Milwaukee, Wis.	134	96	27	7	-	4	11
Peoria, Ill.	43	33	8	-	1	1	4
Rockford, Ill.	54	36	10	5	-	3	7
South Bend, Ind.	76	63	7	5	1	-	9
Toledo, Ohio	100	77	17	2	2	2	11
Youngstown, Ohio	87	67	14	2	3	1	3
W.N. CENTRAL	897	684	112	50	17	13	80
Des Moines, Iowa	U	U	U	U	U	U	U
Duluth, Minn.	32	28	2	2	-	-	5
Kansas City, Kans.	22	13	5	3	1	-	-
Kansas City, Mo.	126	82	14	2	4	3	5
Lincoln, Nebr.	42	35	4	3	-	-	3
Minneapolis, Minn.	253	197	30	18	2	6	31
Omaha, Nebr.	99	71	16	7	2	3	12
St. Louis, Mo.	118	95	16	6	1	-	-
St. Paul, Minn.	108	89	11	3	5	-	18
Wichita, Kans.	97	74	14	6	2	1	6
S. ATLANTIC	1,188	772	246	112	38	17	88
Atlanta, Ga.	U	U	U	U	U	U	U
Baltimore, Md.	230	140	45	34	6	3	23
Charlotte, N.C.	97	73	16	6	2	-	14
Jacksonville, Fla.	157	116	24	7	5	5	8
Miami, Fla.	98	55	25	15	2	1	-
Norfolk, Va.	27	17	6	2	1	1	1
Richmond, Va.	97	64	20	10	2	1	7
Savannah, Ga.	76	46	23	5	2	-	8
St. Petersburg, Fla.	69	49	10	5	3	1	4
Tampa, Fla.	214	142	45	14	10	3	20
Washington, D.C.	101	62	19	14	4	2	3
Wilmington, Del.	22	8	13	-	1	-	-
E.S. CENTRAL	958	669	177	70	19	23	113
Birmingham, Ala.	222	164	37	11	4	6	26
Chattanooga, Tenn.	85	64	10	6	1	4	17
Knoxville, Tenn.	107	78	17	7	5	-	25
Lexington, Ky.	83	60	18	5	-	-	8
Memphis, Tenn.	234	150	45	24	5	10	22
Mobile, Ala.	38	24	10	3	1	-	1
Montgomery, Ala.	33	22	9	1	-	1	8
Nashville, Tenn.	156	107	31	13	3	2	6
W.S. CENTRAL	1,690	1,161	331	114	54	30	131
Austin, Tex.	71	48	13	5	4	1	5
Baton Rouge, La.	38	20	11	5	2	-	2
Corpus Christi, Tex.	54	45	7	1	-	1	7
Dallas, Tex.	206	126	47	22	9	2	2
El Paso, Tex.	125	89	25	5	2	4	16
Ft. Worth, Tex.	108	73	20	9	4	2	7
Houston, Tex.	484	321	100	34	20	9	34
Little Rock, Ark.	90	55	22	7	2	4	4
New Orleans, La.	42	26	12	3	1	-	-
San Antonio, Tex.	254	193	41	12	5	3	25
Shreveport, La.	87	64	15	5	1	2	11
Tulsa, Okla.	131	101	18	6	4	2	18
MOUNTAIN	1,188	823	213	94	30	27	117
Albuquerque, N.M.	111	74	18	12	5	2	4
Boise, Idaho	43	38	4	1	-	-	6
Colo. Springs, Colo.	66	52	5	6	2	1	6
Denver, Colo.	147	99	29	10	4	5	26
Las Vegas, Nev.	295	194	69	21	6	4	19
Ogden, Utah	27	23	3	-	1	-	8
Phoenix, Ariz.	215	140	46	18	2	9	22
Pueblo, Colo.	22	17	2	3	-	-	2
Salt Lake City, Utah	89	63	9	7	5	5	8
Tucson, Ariz.	173	123	28	16	5	1	16
PACIFIC	1,171	853	194	72	25	26	128
Berkeley, Calif.	22	14	8	-	-	-	4
Fresno, Calif.	U	U	U	U	U	U	U
Glendale, Calif.	U	U	U	U	U	U	U
Honolulu, Hawaii	85	64	16	2	-	3	9
Long Beach, Calif.	99	74	15	4	4	2	19
Los Angeles, Calif.	U	U	U	U	U	U	U
Pasadena, Calif.	U	U	U	U	U	U	U
Portland, Oreg.	81	59	10	9	-	3	2
Sacramento, Calif.	U	U	U	U	U	U	U
San Diego, Calif.	184	123	36	13	5	7	15
San Francisco, Calif.	162	125	20	15	1	1	22
San Jose, Calif.	188	130	36	8	11	2	20
Santa Cruz, Calif.	37	30	5	1	1	-	4
Seattle, Wash.	155	109	26	13	2	5	11
Spokane, Wash.	59	46	11	1	-	1	9
Tacoma, Wash.	99	79	11	6	1	2	13
TOTAL	12,241¶	8,684	2,180	849	274	227	1,003

U: Unavailable -: no reported cases

*Mortality data in this table are voluntarily reported from 122 cities in the United States, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.

†Pneumonia and influenza.

§Because of changes in reporting methods in this Pennsylvania city, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.

¶Total includes unknown ages.

Contributors to the Production of the *MMWR* (Weekly)

Weekly Notifiable Disease Morbidity Data and 122 Cities Mortality Data

Samuel L. Groseclose, D.V.M., M.P.H.

State Support Team

Robert Fagan
Karl A. Brendel
Siobhan Gilchrist, M.P.H.
Harry Holden
Gerald Jones
Felicia Perry
Carol A. Worsham

CDC Operations Team

Carol M. Knowles
Deborah A. Adams
Willie J. Anderson
Christine R. Burgess
Patsy A. Hall
Myra A. Montalbano
Angela Trosclair, M.S.

The *Morbidity and Mortality Weekly Report (MMWR)* Series is prepared by the Centers for Disease Control and Prevention (CDC) and is available free of charge in electronic format and on a paid subscription basis for paper copy. To receive an electronic copy on Friday of each week, send an e-mail message to *listserv@listserv.cdc.gov*. The body content should read *SUBscribe mmwr-toc*. Electronic copy also is available from CDC's World-Wide Web server at *http://www.cdc.gov/* or from CDC's file transfer protocol server at *ftp.cdc.gov*. To subscribe for paper copy, contact Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; telephone (202) 512-1800.

Data in the weekly *MMWR* are provisional, based on weekly reports to CDC by state health departments. The reporting week concludes at close of business on Friday; compiled data on a national basis are officially released to the public on the following Friday. Address inquiries about the *MMWR* Series, including material to be considered for publication, to: Editor, *MMWR* Series, Mailstop C-08, CDC, 1600 Clifton Rd., N.E., Atlanta, GA 30333; telephone (888) 232-3228.

☆**U.S. Government Printing Office: 1998-633-228/67057 Region IV**